ACCESSION #: 9605220334

LICENSEE EVENT REPORT (LER)

FACILITY NAME: ZION NUCLEAR POWER STATION UNIT 1 PAGE: 1 OF 4

DOCKET NUMBER: 05000295

TITLE: REACTOR TRIP CAUSED BY ENTRAINED GAS IN INSTRUMENT LINE

RESULTING FROM INSUFFICIENT PROCEDURAL GUIDANCE

EVENT DATE: 04/17/96 LER #: 96-015-00 REPORT DATE: 05/17/96

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: J. BONUCCI, SYSTEM ENGINEERING, TELEPHONE: (847) 746-2084

EXT.3010

COMPONENT FAILURE DESCRIPTION:

CAUSE: SYSTEM: COMPONENT: MANUFACTURER:

REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

While performing PT-20-ST, "Centrifugal Charging and Letdown System Power Operated Valve Tests," a reactor trip occurred at 0206 on April 17, 1996 in response to a 2-out-of-3 channel low flow coincident logic in the 1C reactor coolant loop. The third bistable also tripped coincident with the reactor trip signal. All rods fully inserted on reactor trip and auxiliary feedwater and steam dumps operated to remove excess reactor heat load.

The cause of the event is entrained gas in the sensing lines on loop 1C resulting from insufficient procedural guidance. During a previous forced outage, the reactor coolant system (RCS) loops 1A, 1B, and 1C were drained. It is believed that air entered the sensing lines on loop 1C during this maintenance. The reactor trip occurred following the first performance of PT-20-ST following this' maintenance outage.

Corrective actions include reviewing and revising, as necessary, certain operating procedures for filling and venting of the RCS. Additionally, maintenance practices and procedures will be reviewed and revised, as necessary, to ensure that instrument sensing lines are backfilled or vented following maintenance activities which could impact fill of the instrument lines.

The safety significance of this event is minimal.

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TEXT PAGE 2 OF 4

A. PLANT CONDITIONS PRIOR TO EVENT

Unit 1 MODE 1-Power Operations Rx Power 100% RCS [AB]

Temperature/Pressure 558F/2235 psig

B. DESCRIPTION OF EVENT

While performing PT-20-ST, "Centrifugal Charging and Letdown System

Power Operated Valve Tests," a reactor trip occurred at 0206 hours

on April 17, 1996 in response to a 2-out-of-3 channel low flow

coincident logic in the 1C reactor coolant loop [AB]. The third low

flow signal was also processed by the reactor protection system

(RPS) in conjunction with the reactor trip signal. Auxiliary

feedwater [BA] and steam dumps [BS] operated to remove excess

reactor heat load. All the control rods [AA] fully inserted on

reactor trip. The rod position indications, including rod bottom

lights, did not immediately indicate full insertion for several

positions. This is a position indication problem consistent with previously observed deficiencies with the system. Additionally, after fifteen minutes, the rod bottom bistable had not lit for rod M-14. Subsequent testing determined that the bistable had failed but that the rod had been fully inserted.

Subsequent to the reactor trip, all reactor coolant flow transmitter signals were monitored with diagnostic equipment. The three differential pressure transmitters which monitor reactor coolant system (RCS) flow on loop 1C (1FT-424, 425, 426) were observed to have dampened responses. The dampened signal response was indicative of entrained air/gas in the process sensing lines. The flow transmitter signals for loops A, B and D were also monitored and found to be operating as expected.

Transmitter output was recorded to establish a baseline response. Following collection of baseline data, and with the unit in Mode 3 (Hot Shutdown), the testing sequence of PT-20-ST was repeated. No bistable trips occurred. Data collected during the test confirmed that spikes were present in the output for all three 1C reactor coolant loop flow transmitters coincident with the opening of the Letdown Isolation Valves 1LCV-RC459 and 1LCV-RC460 during PT-20-ST performance. Based on the observed response and the dampened baseline response, venting of the transmitter sensing lines was performed.

During the process of venting, air/gas was observed to be present in the vent stream and a "milky white" (indicative of release of dissolved air/gas as the pressure is decreased during venting) process fluid was released. Some air/gas was noted to leave the transmitter (i.e., "burping") when the vents were first opened. Venting was continued until a clear stream was observed.

Transmitter response data was again captured for the 1C loop flow transmitters. Review of the post venting data indicated improvement in the FT-424 and FT-425 transmitter response and a significant improvement in FT-426 response. All three transmitters exhibited a response more typical of the reactor coolant loop flow.

PT-20-ST was repeated and the transmitter signals recorded did not exhibit the effects of transients/pressure spikes. All flow transmitters exhibited the expected response.

At 0426 hours on April 17, 1996, an Emergency Notification System (ENS) call was made pursuant to 10 CFR 50.72(b)(2) which requires a four hour notification when any event or condition results in a manual or automatic actuation of any engineered safety feature, including the reactor protection system.

C. CAUSE OF EVENT

The cause of the event is entrained gas in the sensing lines on loop

1C resulting from insufficient procedural guidance. The sensing lines were installed with a high point that may allow air to collect. This routing also makes the removal of the air difficult using traditional methodology. Although this air will be greatly compressed (approximately 150 times) as the RCS is pressurized from atmospheric to 2250 psia, there can be some effect on transmitter response. Backfilling of the sensing lines following maintenance that requires draining of the loops will reduce the effect by removing excess air. During a previous forced outage, the reactor coolant system loops 1A, 1B and 1C were drained for Steam Generator work. It is believed that air entered the sensing lines on loop 1C during this maintenance. The reactor trip occurred following the first performance of PT-20-ST following this maintenance outage. A reactor trip signal was processed by the RPS in response to a 2-out-of-3 coincident logic in the reactor coolant loop 1C caused by entrained air/gasses in the process sensing lines. The low flow signal was generated by a pressure wave in the reactor coolant loop resulting from the opening of 1LCV-RC460 during performance of PT-20-ST. This resulted in a pressure perturbation causing a false low flow signal in all three flow transmitters on the 1C reactor coolant loop. The letdown path flows from the 1C loop to the chemical and volume control system. The physical installation of the three transmitters is such that they share a common reference

leg.

D. SAFETY ANALYSIS

This event is being reported pursuant to 10 CFR 50.73 (a)(2)(iv) which requires a thirty day written report when any event or condition resulted in a manual or automatic actuation of any engineered safety feature, including the reactor protection system. The plant experienced a reactor trip from full power. The pressure transient caused by the manipulation of the letdown system isolation valves did not require mitigation by the reactor protection system. Actual flow in loop 1C was not less than the reactor trip setpoint. The only safety significance of the event was that it needlessly challenged plant safety systems and plant personnel. The RIPS responded as designed to the indicated decrease in reactor coolant loop flow. There was no reduction in the protection afforded in the event of an actual low flow condition. The reactor protection system operated as designed to shut down the reactor. Therefore, the safety significance of the event was minimal.

ZLER\96020.LER(3)

E. CORRECTIVE ACTIONS

1. The transmitters for the 1C loop were vented by Instrument Maintenance.

2. Venting of all remaining RCS flow transmitters on Unit 1 was

performed in addition to a second venting on 1-FT-424, 425, 426. Baseline data of transmitter signal response was again collected and evaluated. No air/gas was observed to be removed from any of the transmitters. All transmitters exhibited the expected response to process noise.

3. The RCS flow transmitters on Unit 2 were monitored during normal operation on 4/25/96 and their signal traces were determined to be normal. No evidence of air or gas in the transmitter loops was observed.

4. All Unit 1 reactor coolant loop flow transmitters were monitored prior to and during the next performance of PT-20-ST to confirm that the output was normal.

5. Station operating procedures (GOP's and MI's) for filling and venting of the RCS will be reviewed and revised, as necessary, to assure that instrument sensing lines which can be impacted by the evolution are filled and vented prior to the heat-up/start-up sequence. This item will be completed by September 15, 1996, prior to the next scheduled refueling outage for the Zion units. (295-180-96-018-01)

6. Station maintenance practices and procedures will be reviewed and revised, as necessary, to ensure that instrument sensing lines are back filled or vented following refueling or other maintenance activities which could impact filling of the

instrument sensing lines. This item will be completed by September 15, 1996, prior to the next scheduled refueling outage for the Zion units. (295-180-96-018-02)

F. PREVIOUS OCCURRENCES

While not an identical event, a related situation occurred on December 5, 1995. With the unit operating in Mode 3, a bistable for low reactor coolant loop flow for the 1C loop tripped when starting the 1A residual heat removal (RHR) pump. The wave form of the transmitter output was found to be dampened and entrained air was suspected as the cause. The RHR pump start was repeated with monitoring equipment in place. A false flow transient was observed when the pump was started. The flow transmitter was vented and the transmitter output signal quality improved. The RHR pump was restarted with the transmitter output monitored. A flow transient was observed again however, the amplitude was decreased and the bistable did not trip.

No additional venting was performed and no further investigation was initiated. The spurious RCS flow channel bistable trip was considered to be an isolated event which was eliminated by venting of the sensor. Zion Station had not experienced similar events in the past and has not routinely backfilled and vented RCS flow transmitters following maintenance or refueling outages.

G. COMPONENT FAILURE DATA

None

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Zion Generating Station

101 Shiloh Blvd.

Zion, Illinois 60099

Telephone 708 / 746-2084

May 17, 1996

U.S. Nuclear Regulatory Commission

Document Control Desk

Washington, DC 20555

Dear Sir/Madam:

The enclosed Licensee Event Report number 96-015-00, Docket No. 50-295/DPR-39 from Zion Generating Station is being transmitted to you in accordance with the 10 CFR 50.73 (a)(2)(iv), which requires a thirty day written report when any event or condition resulted in a manual or automatic actuation of any engineered safety feature (ESF), including the reactor protection system (RPS).

Station operating procedures (GOP's and MI's) for filling and venting of the reactor coolant system will be reviewed and revised, as necessary, to assure that instrument sensing lines which can be impacted by the

evolution are filled and vented prior to the heat-up/start-up sequence. This item will be completed by September 15, 1996, prior to the next scheduled refueling outage for the Zion units.

Station maintenance practices and procedures will be reviewed and revised, as necessary, to ensure that instrument sensing lines are back filled or vented following refueling or other maintenance activities which could impact filling of the instrument sensing lines. This item will be completed by September 15, 1996, prior to the next scheduled refueling outage for the Zion units.

Very truly yours,

G. K. Schwartz

Station Manager

Zion Generating Station

GKS/GS/sks

Enclosure: Licensee Event Report

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